

## 5.—Geometric microliths from a dated archaeological deposit near Northcliffe, Western Australia.

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### Abstract

Preliminary examination and a test excavation made in a sandy podzol overlying a silcrete formation near Northcliffe, Western Australia, established that prehistoric man quarried the silcrete and used the immediate locality as a factory for manufacturing stone tools. Two radiocarbon dates based on charcoal samples collected at the excavation site indicate that geometric microliths were manufactured there from about 6000 to about 3000 years BP, and that the site had been a silcrete quarry-factory for some time previous to this. Analysis of pollen samples taken from the dated deposit show that *Eucalyptus diversicolor*, *E. calcophylla*, and *E. marginata* existed in the locality prior to about 6780 years BP and that the two former species and possibly the latter were present at times since.

### Introduction

Geometric microliths are very small, abruptly retouched stone tools known in many Old World stone industries dating to the terminal Pleistocene and Recent periods, and they are a characteristic feature of stone artifact assemblages from many districts in the southern two-thirds of Australia (Mulvaney 1969, Fig. 28). Radiocarbon assay has shown that geometric microliths were used in Australia from about 5000 to 6000 years BP until Modern times (Pearce 1974, Table 2). Various prehistorians (e.g. Mulvaney 1969) have interpreted the introduction of geometric microliths and a range of other distinctive forms of flaked stone tools (e.g. tula adze flakes and invasively flaked points) into the archaeological sequences of a number of Australian sites as a definitive event marking the beginning of a phase or period in continental prehistory.

### The Northcliffe quarry-factory site

Several years ago Mr. G. Gardner, a naturalist from Northcliffe, W.A., identified an outcropping formation of sedimentary rock located about 10 km west of Northcliffe (Fig. 1) as an Aboriginal stone quarry. The rock has since been identified as silcrete (J. E. Glover, *pers. comm.*).

On different occasions Mr. Gardner collected quarrying debris and stone tools from an area of several hectares around the silcrete formation, and he found silcrete artifacts in the section of a bulldozed cutting in a sandy soil overlying the formation. In 1973 I took a char-

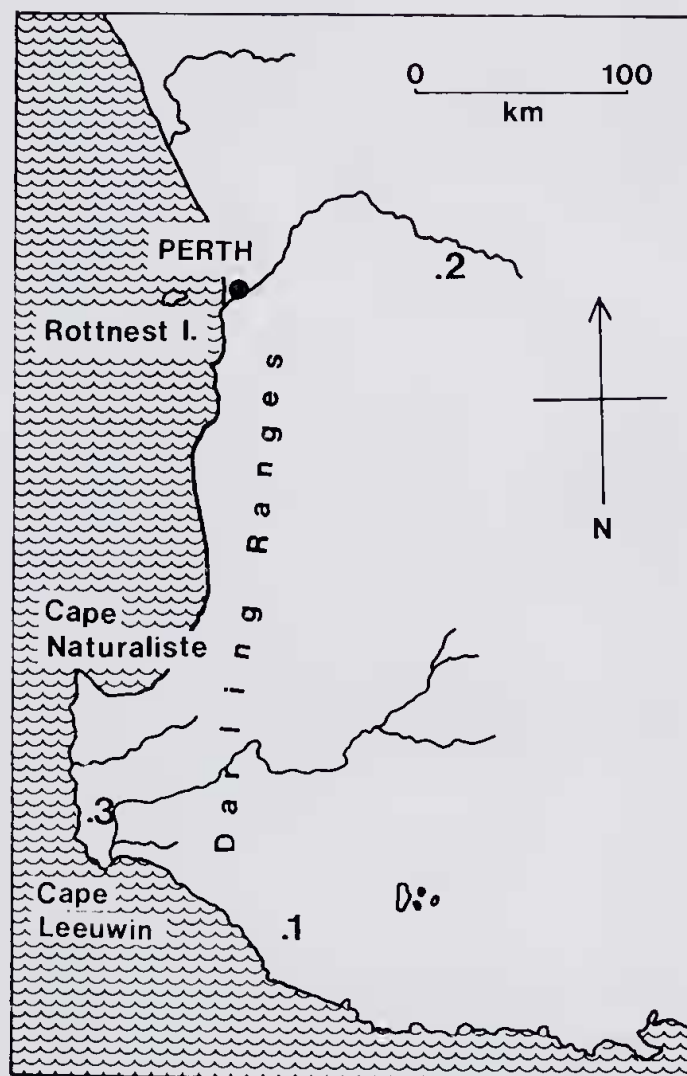


Figure 1.—Map of the south west, Western Australia showing locations of archaeological sites mentioned in the text. 1, Northcliffe quarry-factory; 2, Frieze Cave; 3, Devil's Lair.

coal sample from the upper part of the cutting face at a position (50 cm below a datum level later established at the site) where several artifacts (B1716) were visible. The sample, KS 1 (Table 1), has since been radiocarbon assayed at  $3080 \pm 75$  years BP (ANU 1131: H. Polach, *pers. comm.*).

Mr. W. M. McArthur of the Division of Land Resources Management, CSIRO, Perth, who was present at the site, identified the sandy deposit

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as an iron humus podzol (*pers. comm.*). He also found several flakes (B1715) 30-40 cm deep (i.e. at about the same depth as the artifacts visible in the section) in a 15 x 20 cm test pit dug into undisturbed soil about 2 m away from the cutting. He and I regard these flakes as evidence that occupation took place on the surface of the sand as it accumulated, and that the artifacts we found in the face of the cutting are *in situ*.

In February 1974, Mr. Gardner, Miss A. McConnell and I excavated a 1 x 1.5 m test trench (Trench 1) in the bulldozed cutting at the position where a year previously I had collected charcoal for sample KS 1. We excavated Trench 1 in two, three and four cm arbitrary levels and screened all excavated material through three or five mm sieves. The deposit as shown in the north section of Trench 1 (Fig. 2) shows a

surface plant fibre and leaf zone overlying a dark humic zone about 20 cm thick. This merges into a leached zone about 50 cm thick. At the base of the leached zone is a five cm thick layer of dark sand which in turn rests on a hard pan of iron stained, cemented sands.

The first stone artifacts we excavated in Trench 1 were in the upper part of the leached zone at a depth of 46 to 51 cm below datum. Below this, the number of artifacts increased to a depth of about 75 cm and continued in smaller numbers to the surface of the basal cemented sands (Fig. 2, Table 2). This surface contained several pits or channels 10 to 30 cm deep, and a few stone artifacts were excavated from these. We did not continue systematic excavation into the cemented sands; we screened about 20 kg of these sediments through a five mm sieve but found no archaeological material.

**Table 1**

*Radiocarbon dates based on charcoal samples collected from Trench 1, Northcliffe quarry-factory site, Western Australia*

Sample	Date	Radiocarbon age in years BP	Provenance, with depth below datum
KS 1	ANU 1131	3 080 ± 75	upper part of leached zone, 50 cm
KS 2	SUA 379	6 780 ± 120	lower part of leached zone, 85-95 cm

**Table 2**

*Distribution of stone artifacts in Trench 1, Northcliffe quarry-factory site, Western Australia*

Radiocarbon dates	Depth in cm below datum	Geometric microliths <sup>1</sup>	Notched flakes and other re-touched tools	Blades	Blade-lets	Silcrete artifacts				Artifacts of other stone	
						Flakes	Chips <sup>2</sup>	Cores	Debris		
ANU-1131 3080 ± 75	46-51					2					
	51-53				2	8	6+				
	53-57	1 atypical	1		3	39	47+				
	57-59	2 atypical	2		2	48	57+				
	59-60		2		6	57	110+				
	60-62		3	2	2	76	50+			2	1 quartz chip
	62-64	2	1		1	54	50+				2 quartz chips 1 quartz flake 1 quartz bladelet
	64-66		2	6	5	81	50+			3	
	66-70	6,2 atypical	2	3	11	149	250+				
	70-72	4,1 atypical	2	4	2	106	250+			2	6 quartz flakes and fragments 1 pebble
	72-74	2	4	5	1	97	250+	5			3 quartz fragments
	74-78	1 atypical	3	1	11	112	250+	4	1		2 quartz fragments 1 fragment of gneiss
	78-82	3		1		38	100+	1			
	82-85	1			1	14	20+				8 quartz chips
SUA 379 6780 ± 120	85-90		2				20+	1	1		1 quartz fragment 1 quartz flake
	90-96		1			5	2+	1			1 quartz core 1 quartz flake
	96-98					5	9+				1 quartz bladelet 2 quartz flakes
	98-103					7	1+				2 quartz fragments
	103-c,120					5	4+			2	1 quartz fragment 2 quartz flakes 2 chert flakes
		18 typical 7 atypical	25	22	46	903	1526+	12	11	40	

<sup>1</sup> atypical indicates irregular or partly retouched specimens.

<sup>2</sup> + indicates that total chips were not recovered.

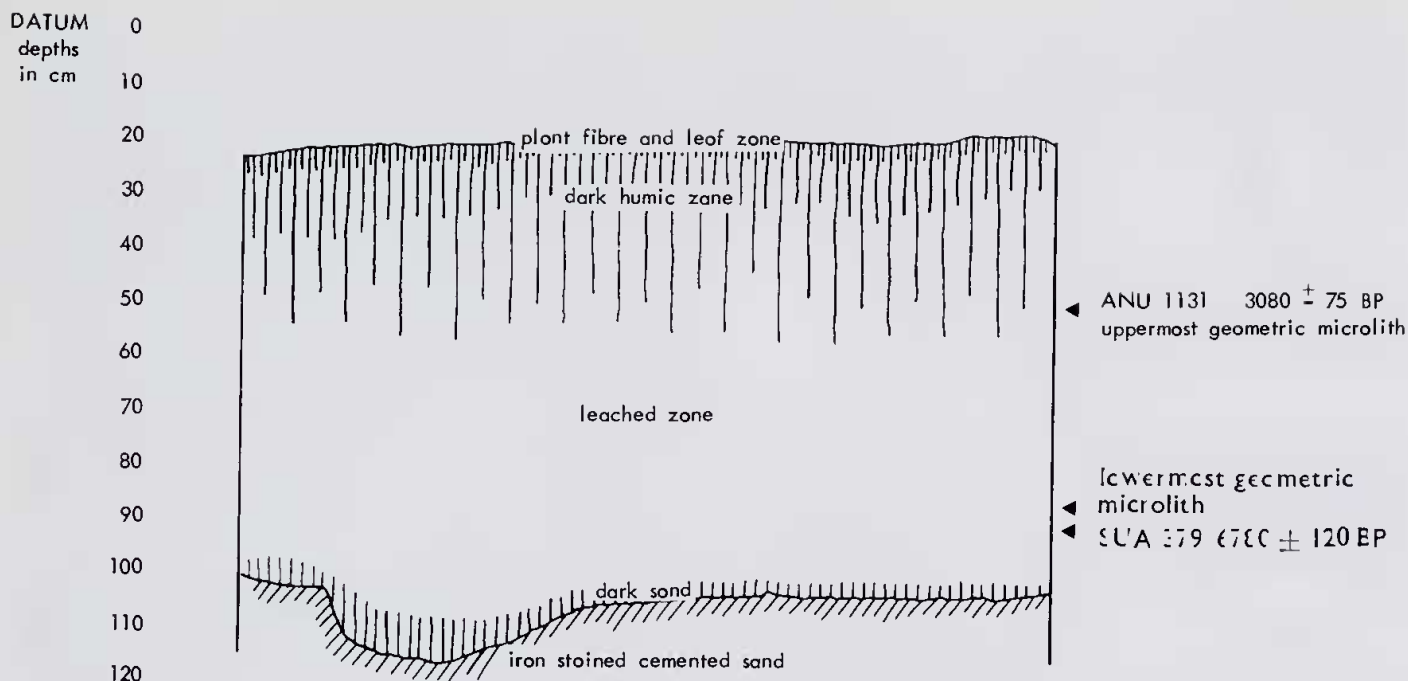


Figure 2.—North section of Trench 1, Northcliffe quarry-factory.

Trench 1 contained no vertebrate remains or mollusc shells. Charcoal occurred in varying quantities throughout and we collected several samples for radiocarbon assay. One of these samples, KS 2, taken from a depth of 85 to 95 cm in the lower part of the leached zone (Fig. 2), was submitted for dating and yielded an age of  $6780 \pm 120$  years BP (SUA 379: R. Gillespie, *pers. comm.*) (Table 1).

### Stone artifacts

The largest quantities of stone artifacts were in the leached zone between 65 and 80 cm (Table 2). The assemblages from arbitrary levels at this depth comprise retouched tools, large irregular flakes or fragments, numerous small flakes and very many tiny chips. These last are flakes which have a maximum dimension of less than one cm; many of these (measuring  $< .5$  cm) were not retained. There are also many blades and bladelets which, following Tixier (1963, p. 38), can be distinguished on the basis of width, bladelets having a maximum width of 1.2 cm (e.g. Fig. 3d). No blade cores were recovered from Trench 1 though these have been collected from other sites in the district. Some of the blades and bladelets are snapped short, perhaps deliberately. None is retouched.

All of the 13 cores from Trench 1 were used in flake production. One of these, from 74 to 78 cm depth, is a typical discoidal core. There are also a number of short (2-4 cm long) flakes with broad, thick faceted butts and oval or triangular forms which were probably produced on discoidal cores. The single quartz core (depth 96-98 cm) is of bipolar or scalar type (White 1968).

Half of the retouched tools are geometric microliths of trapeze (Fig. 3a), crescentic (Fig. 3b) or triangular form (Fig. 3c). We recovered 18 typical geometric microliths from Trench 1. Almost all of the other retouched tools are flakes with one or two notches, the exceptions being retouched flakes. The very high proportion of *débitage* ranging from flakes or fragments to hundreds of tiny chips probably resulting from the manufacture of finely retouched tools such as geometric microliths, as well as the retouched tools themselves, indicate that the site is not only a quarry but also a factory where geometric microliths were one of the main products.

Only two flakes, both made of silcrete, occurred above the position of ANU 1131. The uppermost geometric microlith came from a depth of 53 to 57 cm or about three to seven cm below the sample position of ANU 1131 (Fig. 2, Tables 1, 2). The lowermost geometric microlith (this piece is illustrated in Fig. 3b) was recovered one to three cm above the upper limit of the level from which we collected charcoal for SUA 379 (Fig. 2, Tables 1, 2). These radiocarbon dates thus show that geometric microliths were being manufactured at the factory from about six thousand to about three thousand years ago.

Relatively few artifacts were found below the sample position of SUA 379. However the silcrete artifacts from this depth and below are similar (i.e. quarried fragments, tiny chips and flakes of small size, some with small butts and parallel dorsal flake scar ridges) to the silcrete *débitage* in the assemblages containing geometric microliths higher up in the sequence, thus sug-

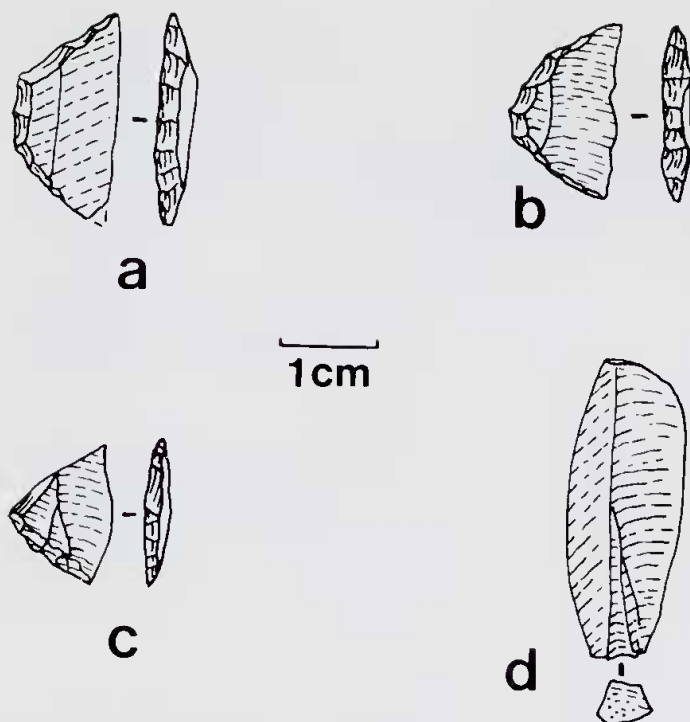


Figure 3.—Geometric microliths and a bladelet excavated from Trench 1, Northcliffe quarry-factory.

gesting that essentially the same industrial activity took place. It is possible then that a larger artifact sample from the lower part of the deposit would contain geometric microliths.

Most of the artifacts from Trench 1 and all of the retouched tools are made of silcrete, the few exceptions being quartz pieces (e.g. B2418), a fragment of gneissic rock (B2412) and two flakes (B2418, B2420) made of a distinctive form of fossiliferous chert (J. E. Glover, *pers. comm.*). This chert is similar to that used for artifacts from many sites in the Perth area (Fig. 1: Glover and Cockbain 1971; Hallam 1972) and in the late Pleistocene layers of Devil's Lair (Fig. 1: Dortch 1974; Dortch and Merrilees 1973; Glover 1974). One of the two chert flakes comes from a deep depression in the surface of the basal cemented sands (Fig. 2) and the other comes from dark sand just above the basal sands. These flakes may be considerably older than the artifacts in the leached zone, and they may have dropped down to the hardpan during the deflation of an earlier soil. Hallam (1972, pp. 14-15) has postulated that fossiliferous chert of this kind predominated in the early assemblages from sites on the coastal plain to the west. However on the south coast there is evidence to suggest that here fossiliferous chert continued to be used in quantity during the later prehistoric period. Gardner has collected numerous fossiliferous chert artifacts from surface sites in the Northcliffe area which also contain quantities of geometric microliths and bladelets of silcrete and quartz typical of later Australian stone industries. He has also located an outcrop of fossiliferous chert about ten km east of Northcliffe which would have been accessible during the later prehistoric period. It seems likely then that fossiliferous chert was used until relatively recent times in the Northcliffe area.

## Pollen Analysis

Pollen samples were taken at different depths in Trench 1. These were submitted to Dr. B. E. Balme of the Geology Department, University of Western Australia for analysis. His report (B. E. Balme, *pers. comm.*) stated that a sample from a depth of 47 cm contained pollen grains, the dominant species being *Eucalyptus calophylla* and *E. diversicolor* though some grains "of *E. marginata*-type were also fairly common". A sample from 68 cm contained a similar plant microfossil assemblage to that of the previous sample. The next sample from 87 cm contained no pollen. The lowermost sample from the dark sand resting on the basal cemented sands (depth 121 cm) contained pollen grains of the three above *Eucalyptus* species with *E. diversicolor* appearing to be "relatively more abundant" than in higher samples.

These three *Eucalyptus* species are at present dominant in the Northcliffe area. The pollen analysis suggests then that climate in this locality was at various times during the Recent period much the same as it is at present. In his recent study Churchill (1968, p. 146) concludes that "the climate [of the extreme south west] from 4000 to 3000 B.C. was favourable for *E. diversicolor*". The oldest Northcliffe pollen sample above suggests that conditions were favourable for *E. diversicolor* even earlier during the Recent period.

## Western Australian Museum catalogue numbers of silcrete artifacts illustrated in Fig. 3

a. B2410	b. B2414
c. B2413	d. B2410

Stone artifacts excavated from Trench 1 at the Northcliffe silcrete quarry-factory are listed in the Western Australian Museum register under catalogue numbers B2401-B2421. All catalogue numbers mentioned in the text pertain to the Western Australian Museum register.

## Discussion

Hallam (1972, pp. 16-17) has published four self consistent radiocarbon dates ranging from  $3090 \pm 240$  years BP (ANU 830) to  $110 \pm 70$  years BP (ANU 827) which are associated with tool assemblages containing geometric microliths excavated at Frieze Cave near York, W.A. (Fig. 1) some 300 km north of Northcliffe. The Frieze Cave dates and those from the Northcliffe quarry-factory (Table 1) indicate that the use of geometric microliths in south western Australia persisted from about 6 000 years ago until the Modern period, this being the longest duration for microlithic industries yet recorded for Australia (see Pearce 1974, Table 2).

The Northcliffe dates do not support Pearce's recent hypothesis (1974, p. 307), based on previously available radiocarbon dates (e.g. ANU 830), that "the introduction of backed blades [geometric microliths] was earliest in New South Wales and progressively later away from that area". The earlier date from Northcliffe shows that geometric microliths are not a relatively late innovation in the south west, and that it is possible that they occur here earlier than in south eastern Australia. Until more data be-

come available I see no reason to assume that the beginning date of the microlithic industries in Western Australia differs greatly from that of the microlithic industries in eastern regions.

The dates reported here from Northcliffe, those from Frieze Cave (Hallam 1972), and the sequence of radiocarbon dates from Devil's Lair (Dortch 1974; Dortch and Merrilees 1973) provide a radiocarbon dating sequence for south western prehistory which extends from about 25,000 years BP to Modern times. A relatively recent date SUA 364:  $6490 \pm 145$  years BP (R. Gillespie, *pers. comm.*), has been obtained from a charcoal sample collected during the 1973 excavation of Devil's Lair, Trench 7 (Dortch 1974). The sample on which this date is based comes from layer G (Dortch 1974, Fig. 3), a sandy deposit containing a quartz flake (B1846), some mussel shell (e.g. B1846) and other faunal remains, and some possible bone artifacts (e.g. B1847). No stone tool forms of great diagnostic value are associated with this date from Devil's Lair or with the older date (SUA 379) from Northcliffe. Nevertheless it is possible that SUA 364 and SUA 379 relate respectively to an early phase assemblage left by some of the last occupants of Devil's Lair, and an initial late phase assemblage marking an early period of quarrying and tool manufacture at Northcliffe. If this is true, then the early-late phase transition in south western Australia took place over 6000 years ago. Further investigations at these two sites should provide more data relevant to the age and significance of this transition.

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